

WE CLAIM

1. A method of epoxidizing an unsaturated compound having a carbon-to-carbon double bond to form an oxirane ring across the double bond comprising

adding to said unsaturated compound an oxidizing agent selected from hydrogen peroxide, acetaldehyde monoperoxide, an organic hydroperoxide, or a combination thereof, to form a reactant mixture; and

forming the reactant mixture in a film against a wall of the thin-film reactor that is at a temperature sufficient for reaction of the oxidizing agent with the unsaturated compound to form an oxirane ring across a double bond of the unsaturated compound.
2. A method in accordance with claim 1, wherein the method is a continuous method such that the reactant mixture is continuously fed to the thin-film reactor and the epoxidized unsaturated compound is continuously recovered from the thin-film reactor, maintained under isothermal conditions.
3. A method in accordance with claim 2, further including the step of evaporating water from the thin-film reactor.
4. A method in accordance with claim 1, wherein the film of reactants is heated to a temperature in the range of about 65°F to about 150°F.
5. A method in accordance with claim 1, wherein the molar ratio of unsaturated compound to the oxidizing agent is in the range of 0.5 - 1.0 to 1.0 - 0.05.
6. A method in accordance with claim 2, further including the step of continuously forcing a film of said reactant mixture against said heated or cooled reactor wall, by centrifugal force, for efficient heating or cooling, in film form, of the reactant mixture.
7. A method in accordance with claim 2, further including the additional step of recycling non-epoxidized and/or incompletely oxidized unsaturated compound to the thin-film reactor for epoxidation of non-oxidized and/or incompletely epoxidized unsaturated compound.

8. A method in accordance with claim 1, wherein the feed rates of unsaturated compound, and peroxides can be varied to affect production rates and product quality.
9. A method in accordance with claim 8, wherein variable feed rates allow for changes in production rates and product quality.
10. A method in accordance with claim 5, wherein the molar ratio of unsaturated compound to oxidizing agent is in the range of about 0.9 - 1.0 to about 1.0 - 0.5.
11. A method in accordance with claim 5, wherein the molar ratio of unsaturated compound to oxidizing agent is in the range of about 1.1 - 1.0 to about 1.0 - 0.9.
12. A method in accordance with claim 5, wherein the molar ratio of unsaturated compound to oxidizing agent is about 1:1.